

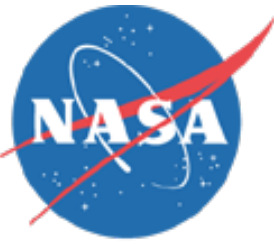


Ice sheet wide comparison of coincident laser and radar observations from ICESat-2 and CryoSat-2 for Greenland and Antarctica

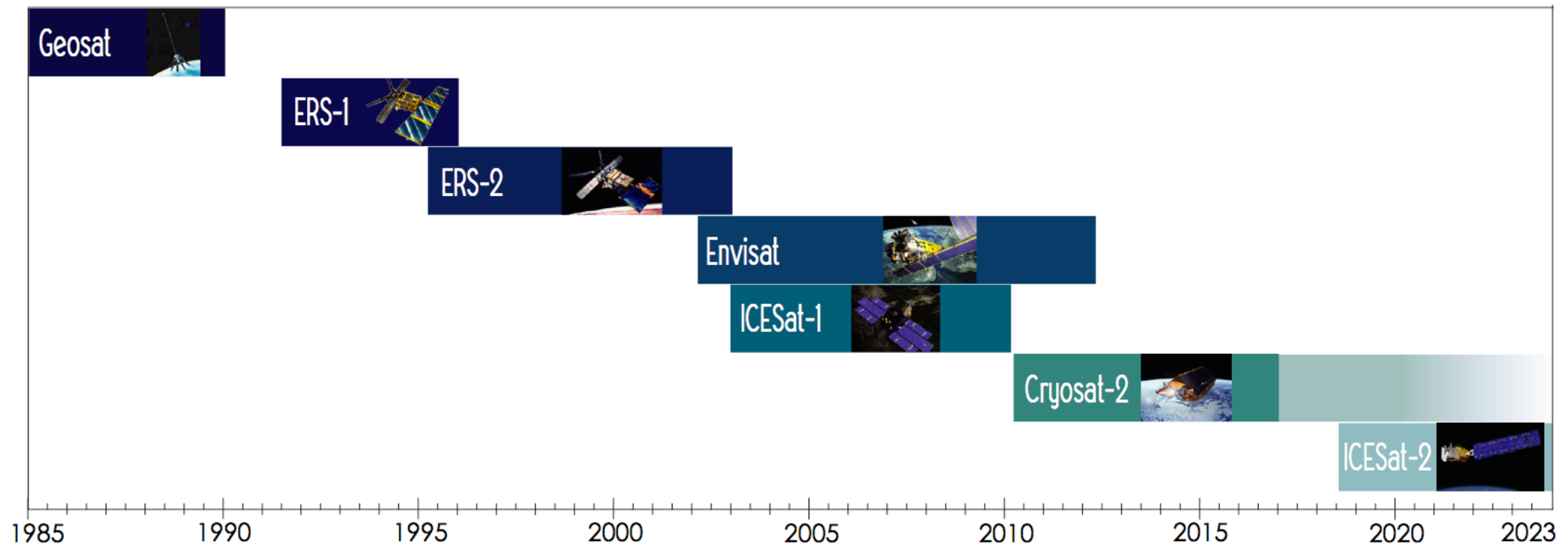
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AGU Meeting 2019, San Francisco, U.S.A

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Altimetry record





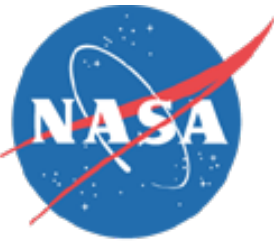
Introduction

- With the launch of ICESat-2 in September 2018 we have for the first time high spatial and temporal overlap with another radar mission, in the form of CryoSat-2
- Here we will have the “first” ever look at unbiased laser and radar measurements at continental wide scales.
- We can use the differences to better understand and constrain the effect snow properties have on the radar altimeters.
- It can help us further help us constrain trends and seasonality over the ice sheets to improve the entire radar altimetry record.
- Having this overlap will hopefully help us to remove the residual penetration effects of the radar signal, not fully corrected for using the empirical relationship between elevation and radar waveform shape.

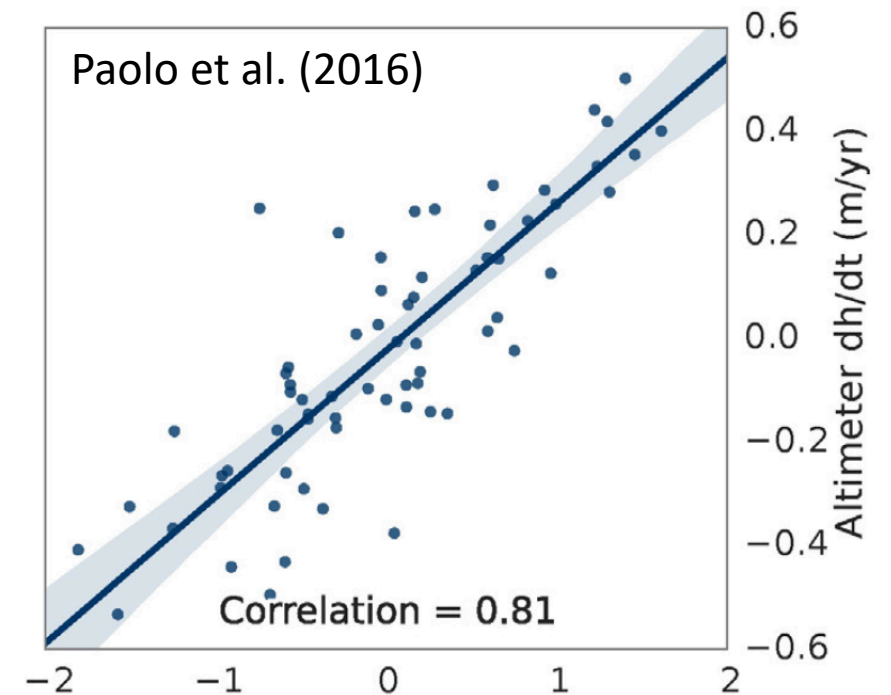
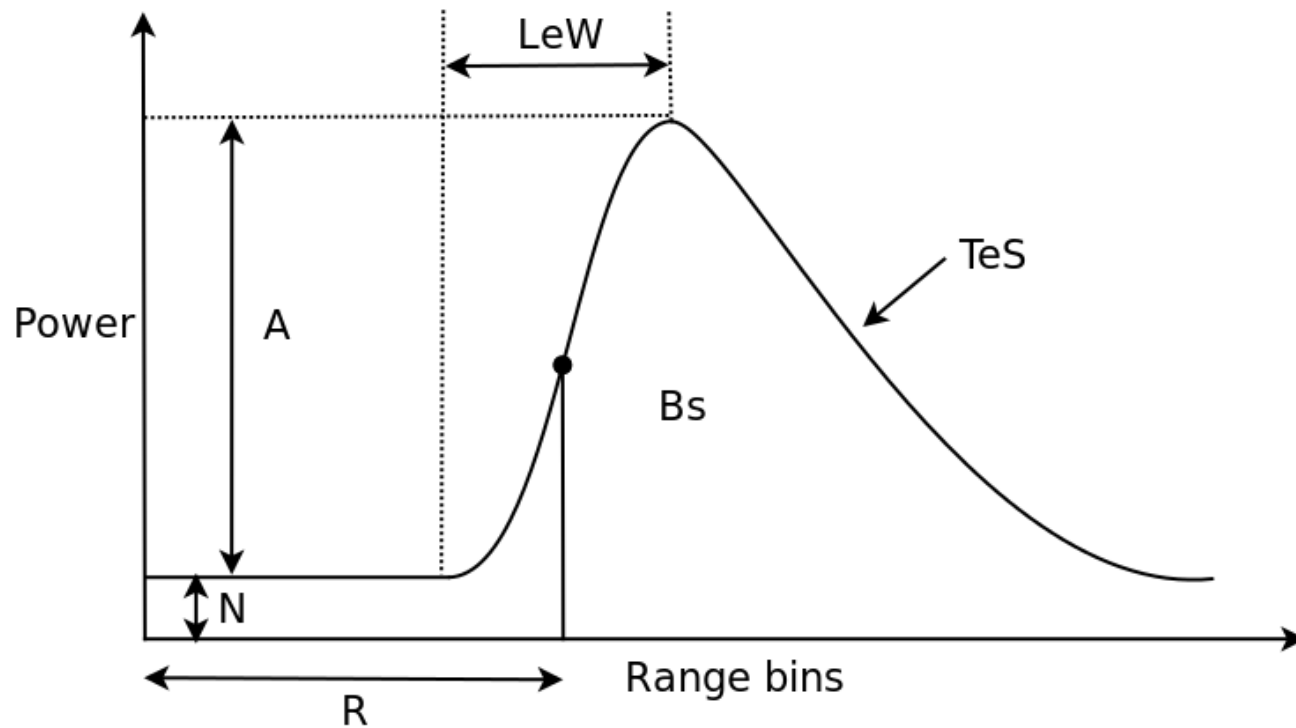


Possibilities and limitations

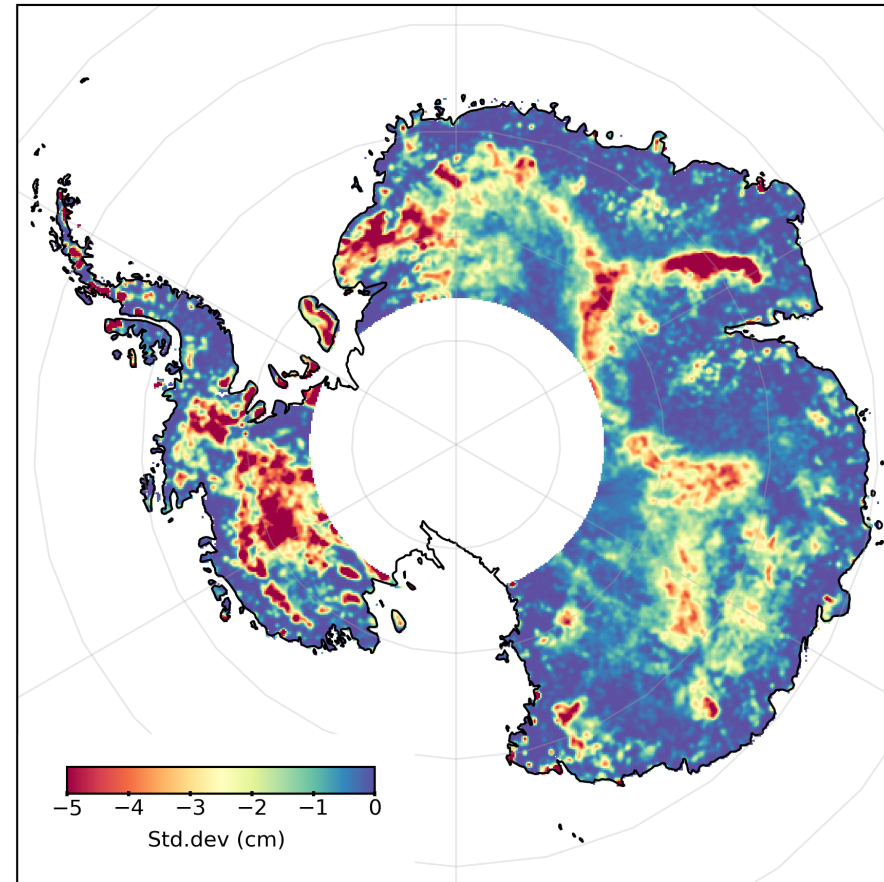
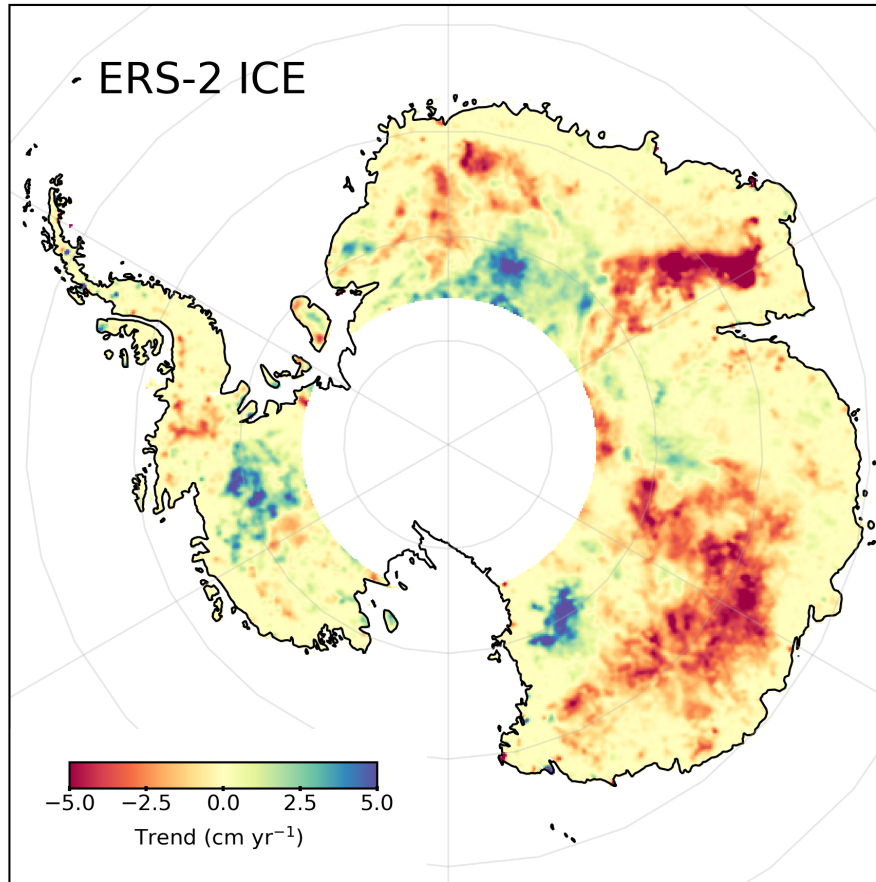
- Better understanding of the trend and seasonality, especially the interior of Antarctica, and how these surface and sub-surface processes impact radar altimetry.
- Better modelling of the slope induced error for altimetry, which is still the biggest error in radar altimetry error budget.
- Improved capabilities of validation of the current and future altimetry missions to improve the long term record.
- Modelling and removing the residual signal in the radar altimetry record poses large difficulties due to difference in antenna polarization and orbit geometry between missions.



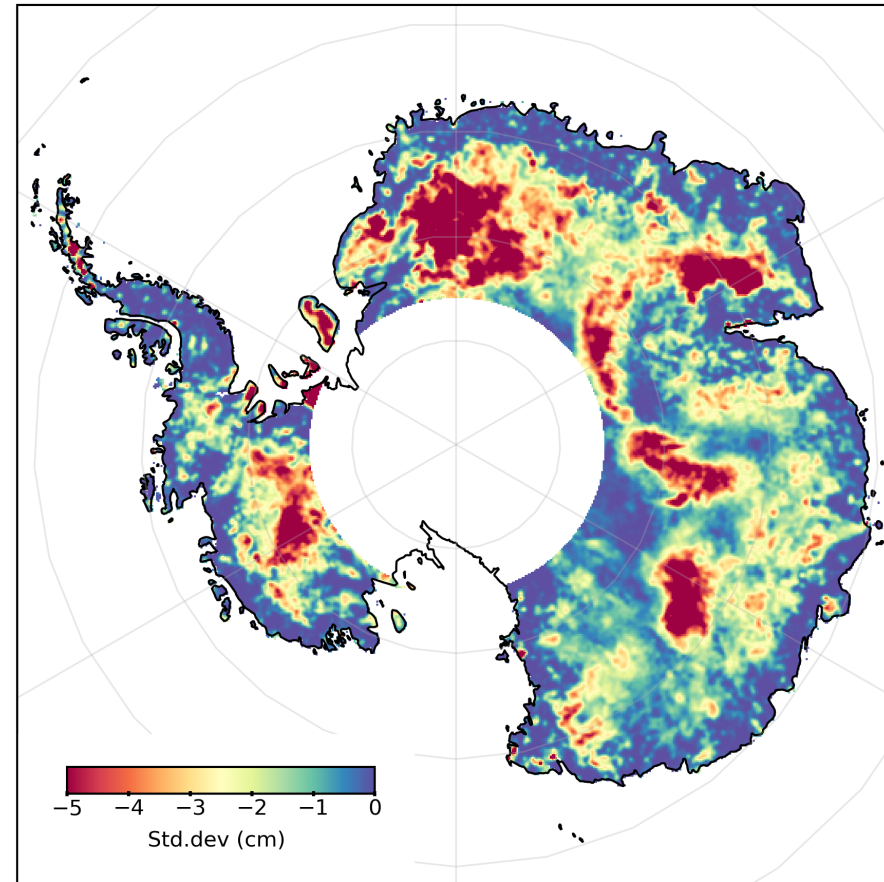
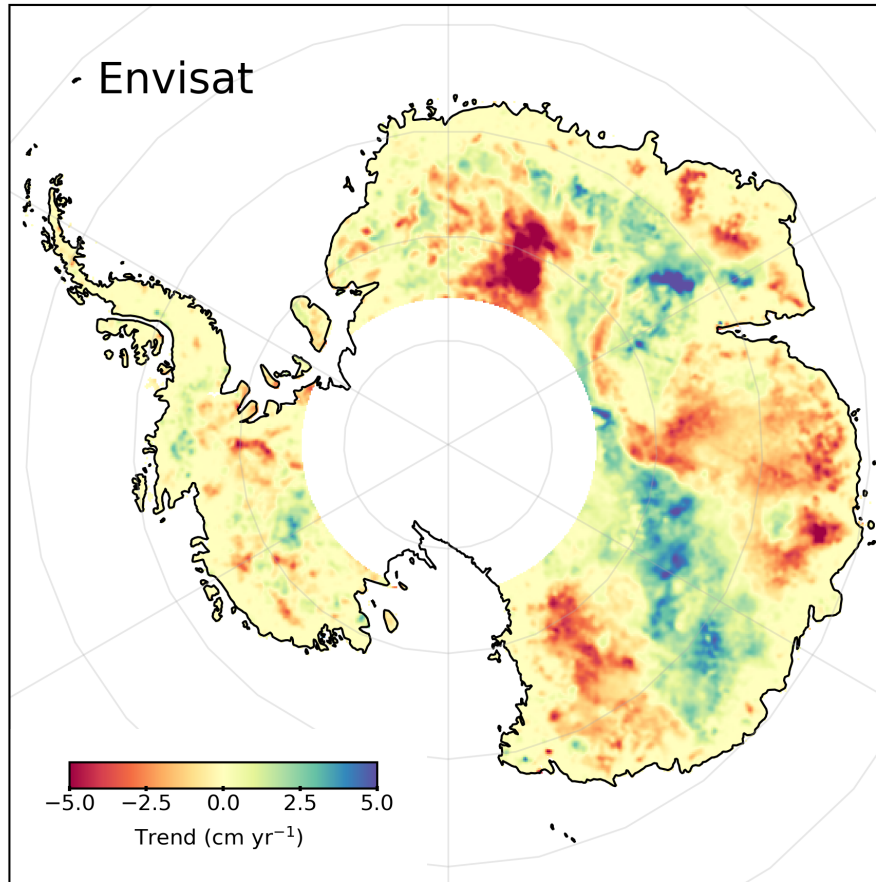
Empirical correction for radar altimetry



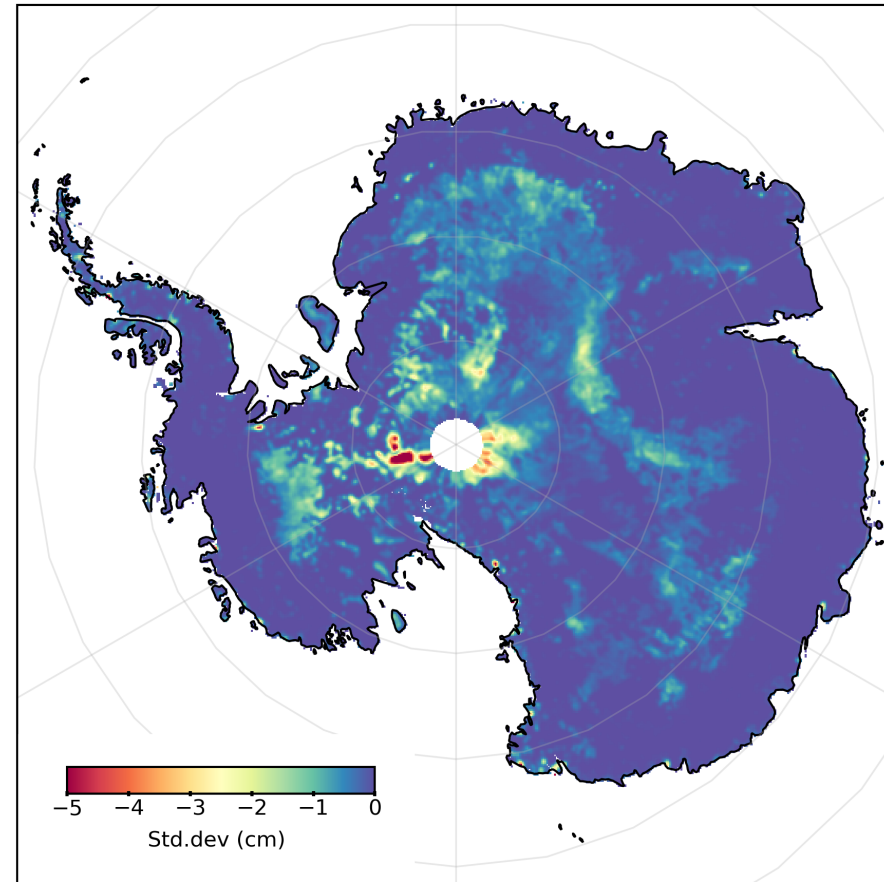
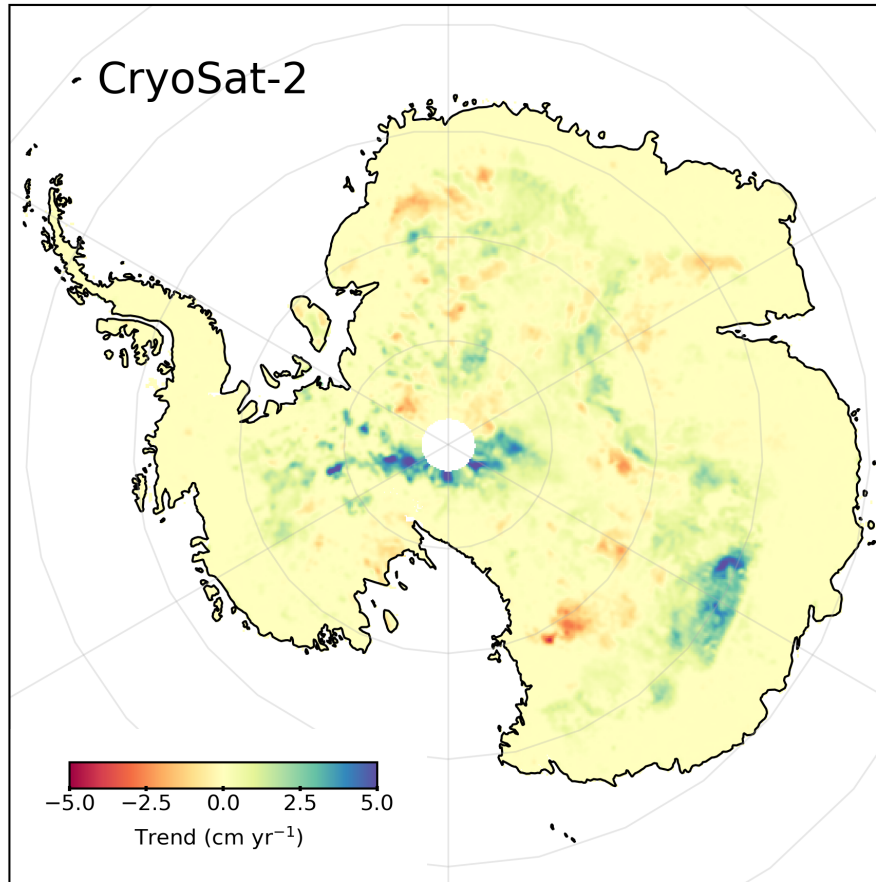
Long term trends and corrections

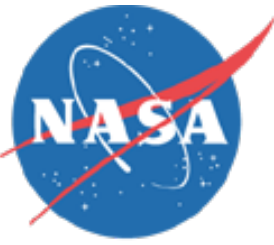


Long term trends and corrections

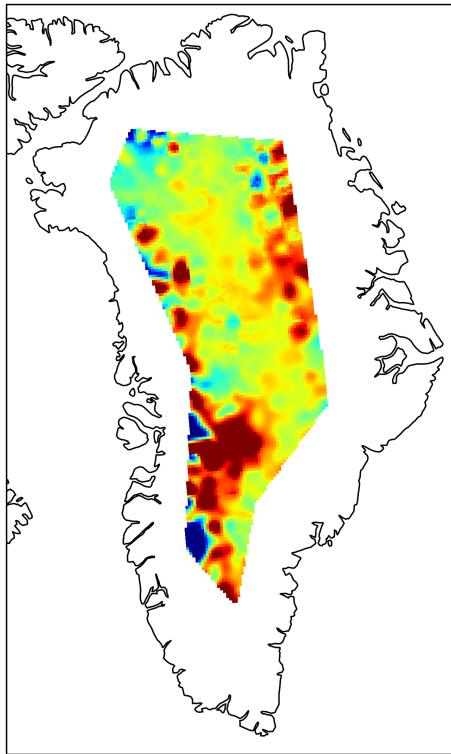


Long term trends and corrections

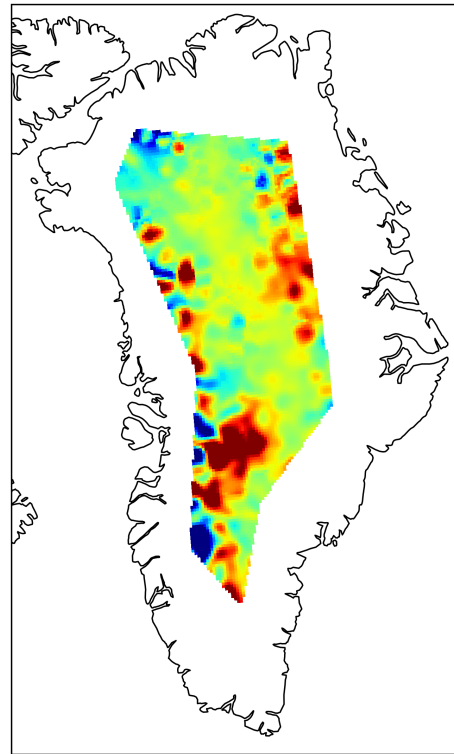




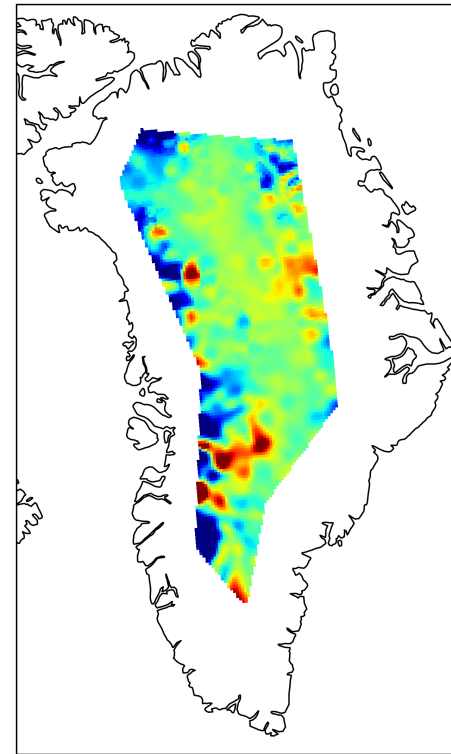
Biases – Greenland



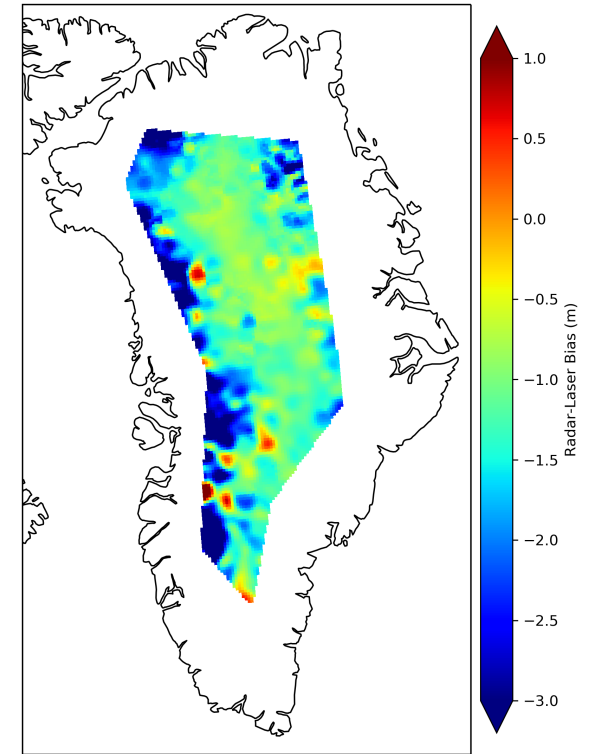
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20%



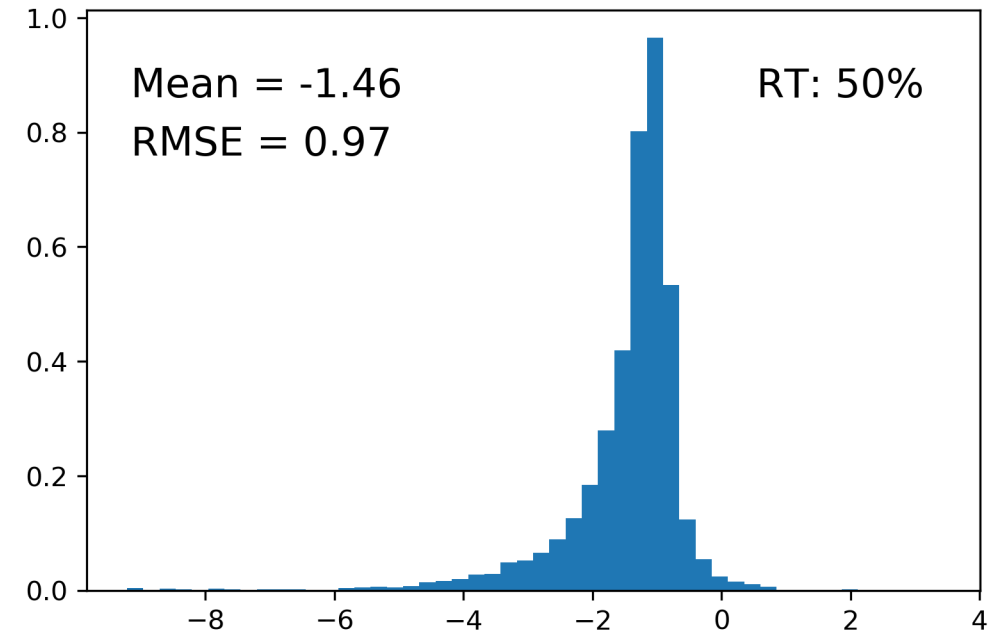
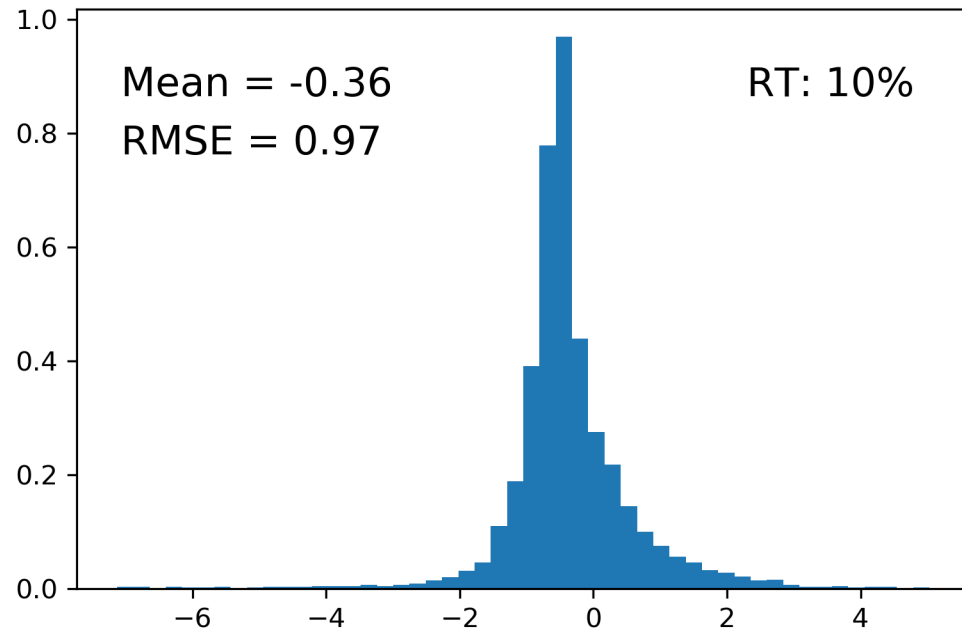
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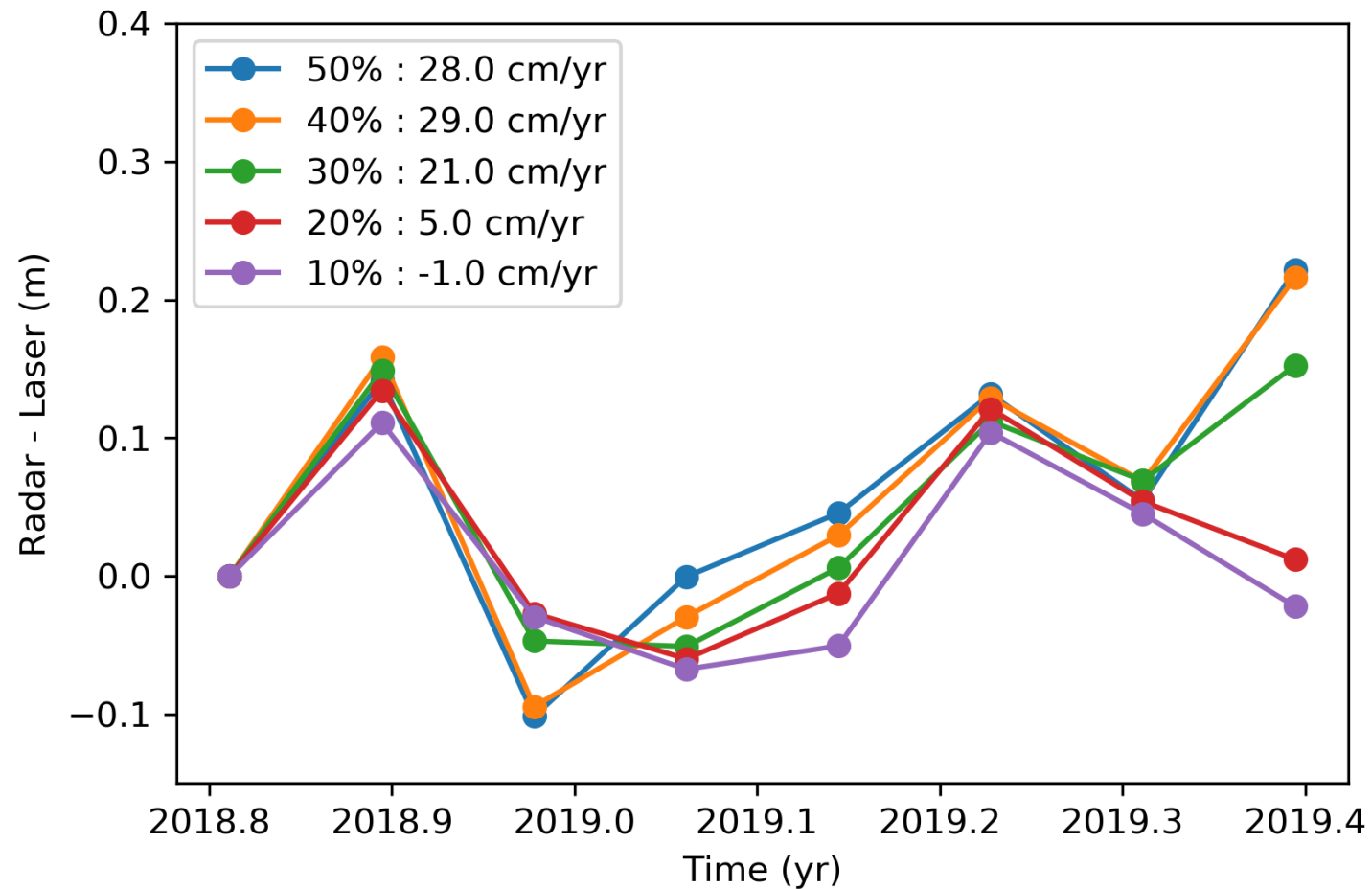


Histogram - Greenland



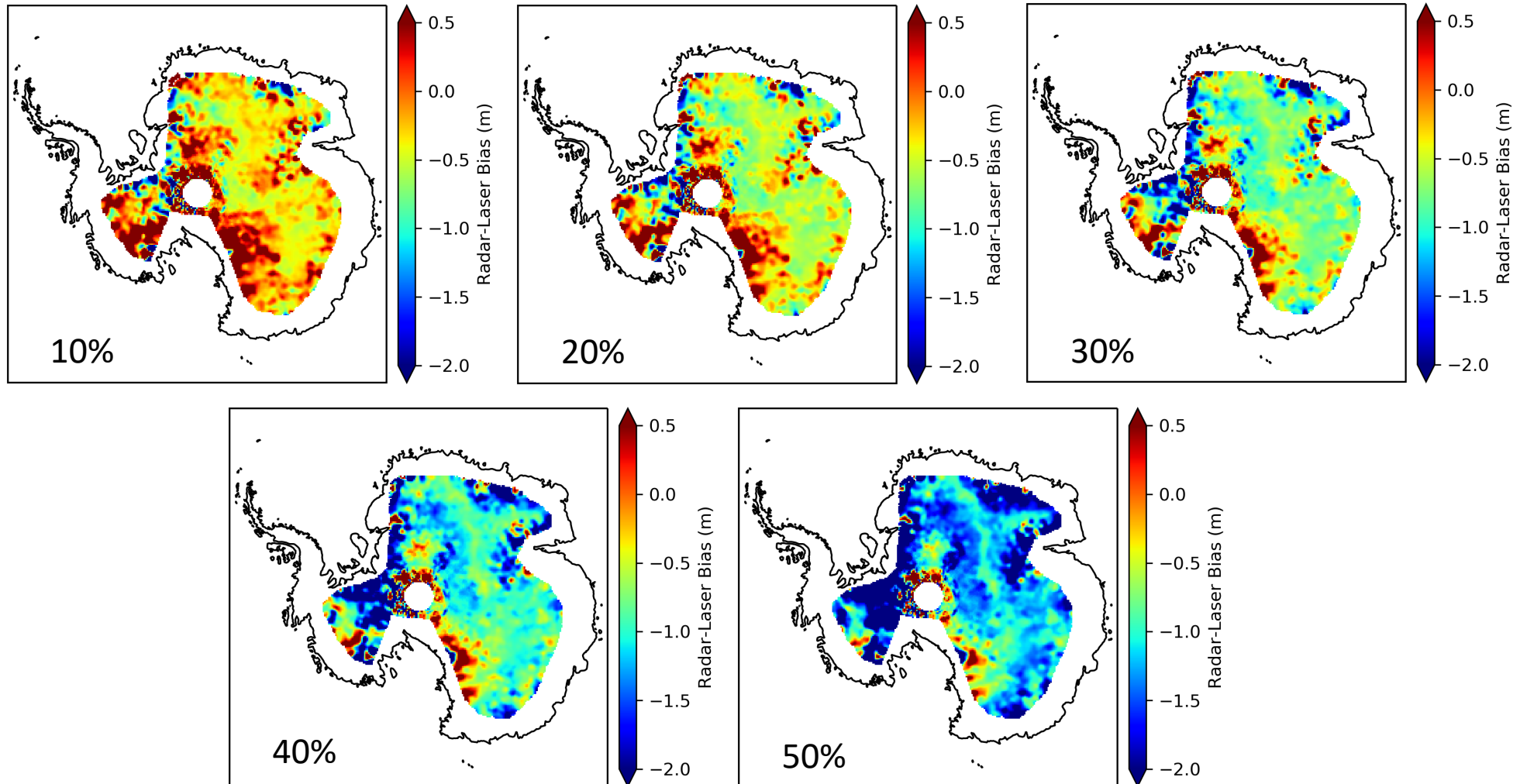


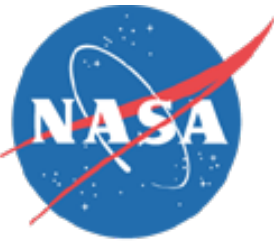
Time series – Greenland



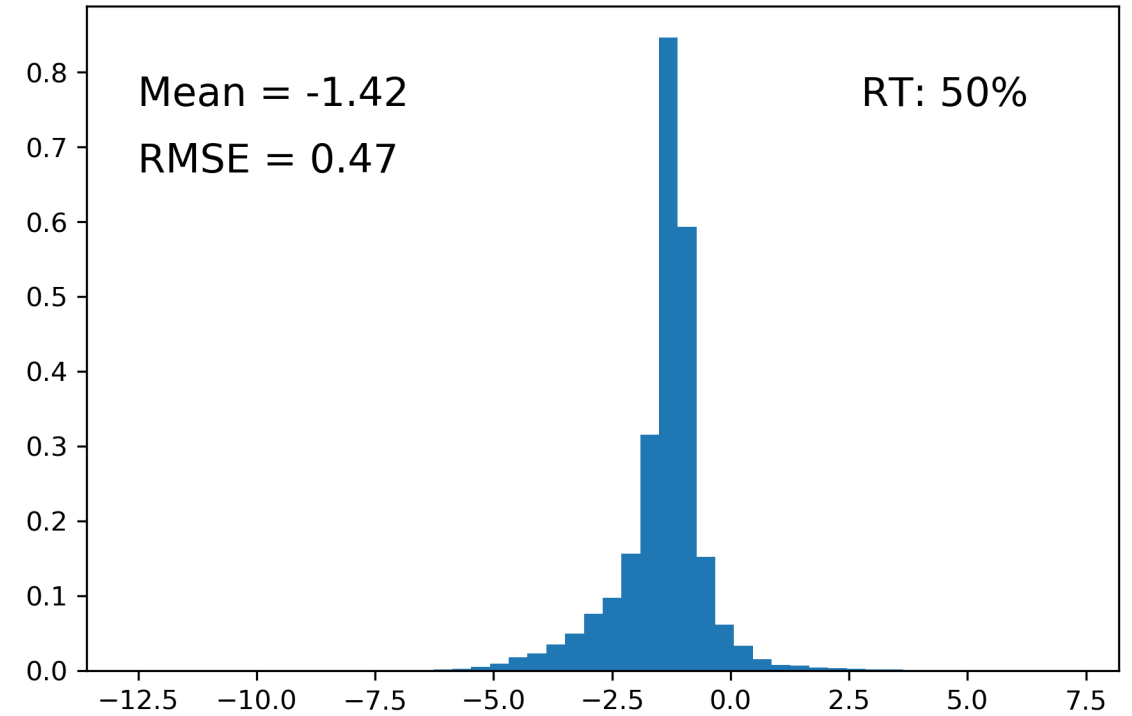
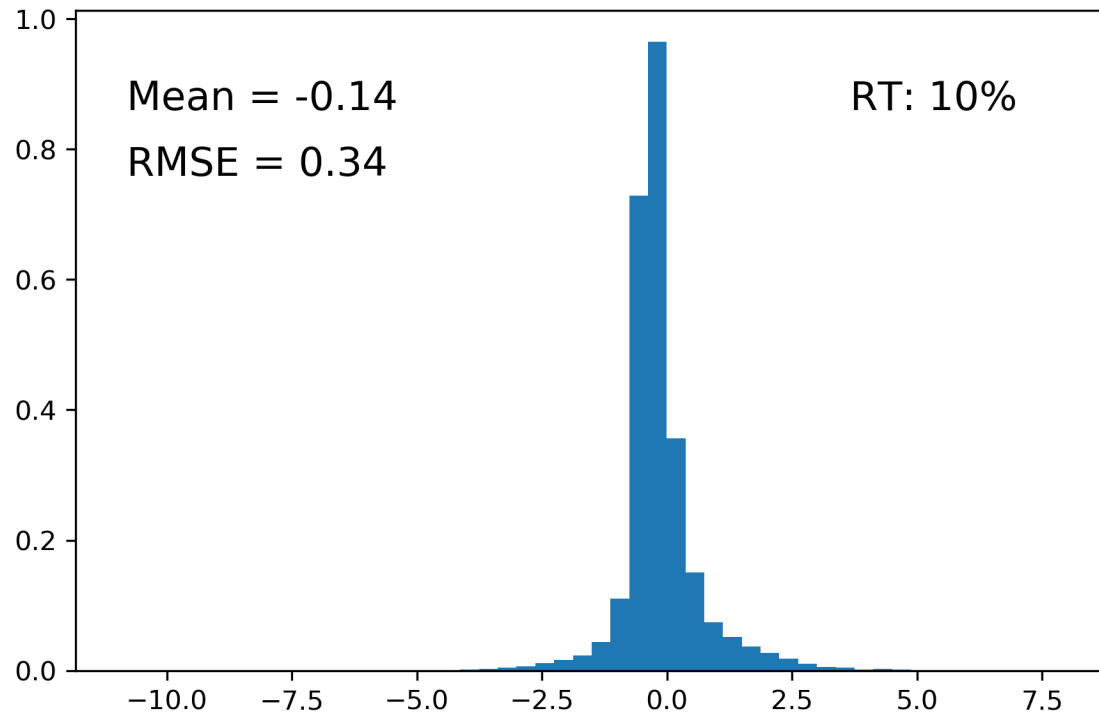


Biases - Antarctica



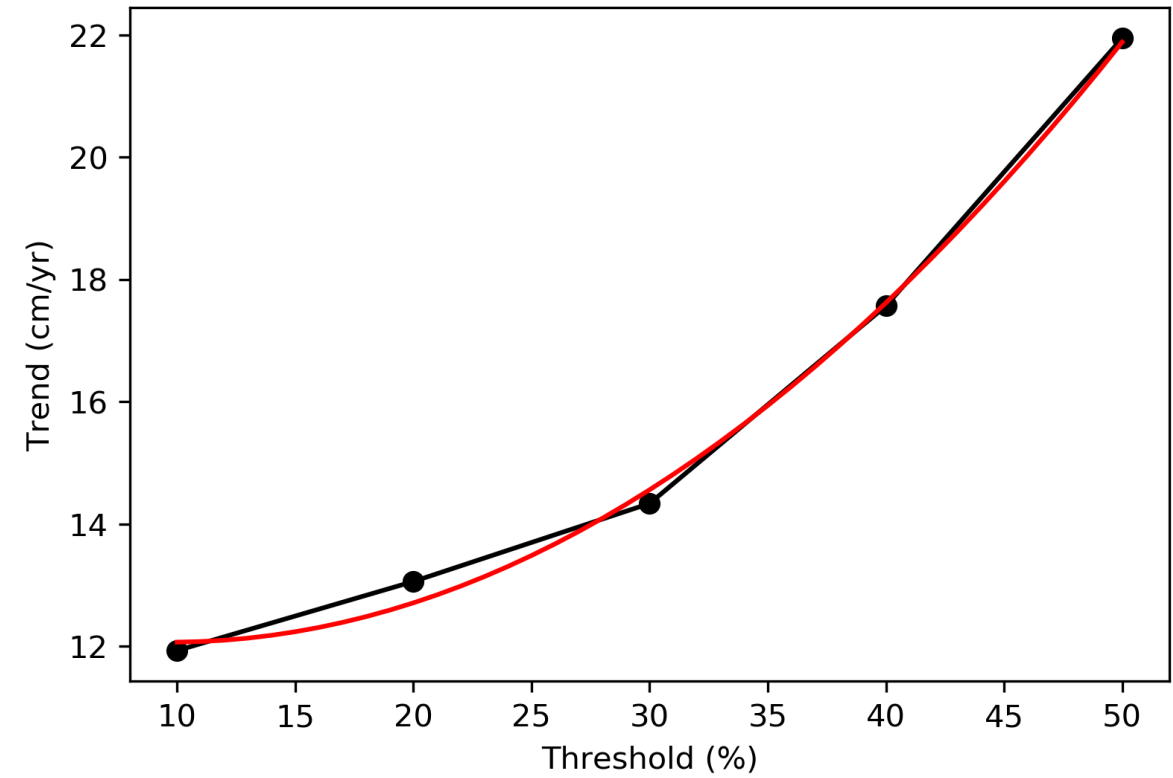
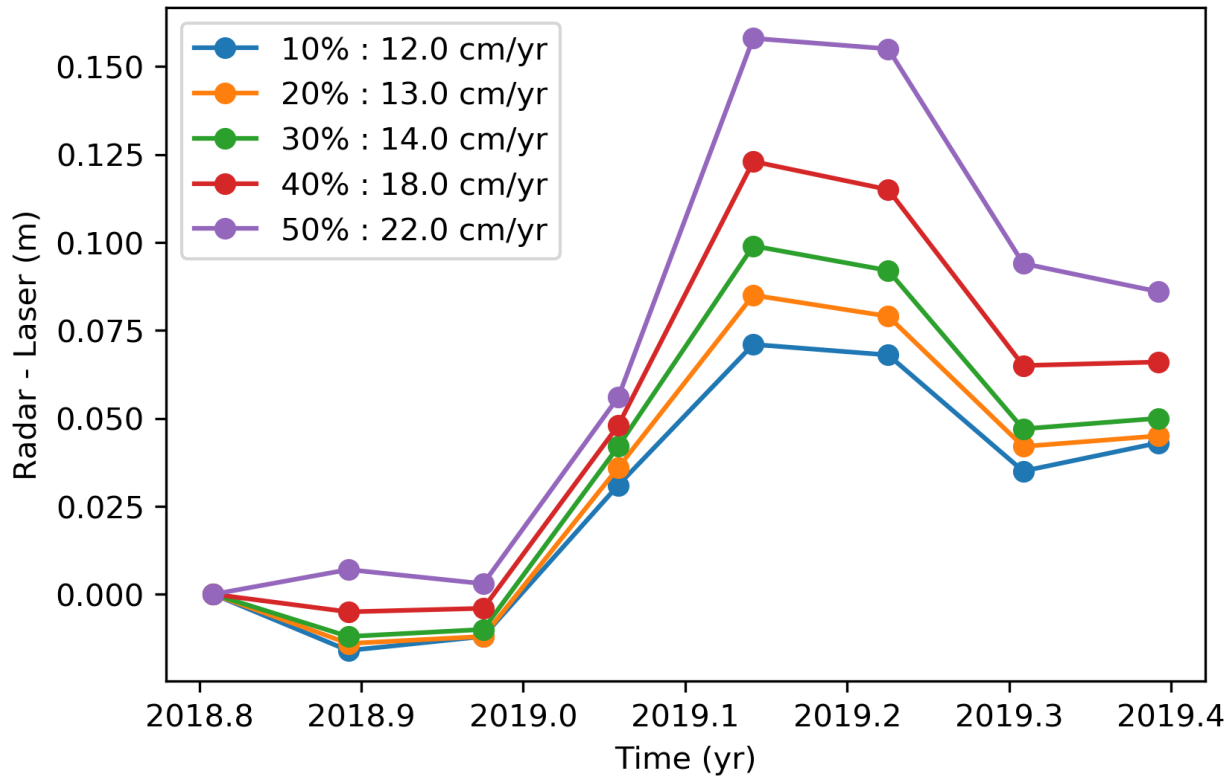


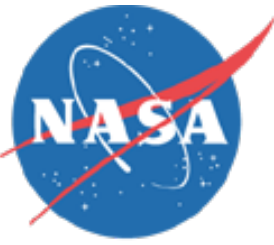
Histogram – Antarctica





Time series - Antarctica





Summary

- Biases and precision follows retracking threshold
- Increased retracking threshold produces a trend of increased magnitude
- Spatial patterns reflect surface (10%) and sub-surface processes (50%)

Thank you!